

Work Order ID 50625 ✓



Page 1

July 17, 2009 11:40:07 AM

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: D

Stop



Item Name: Crosstube Turning Detail

Start Date: 7/24/09 Start Qty: 1.00



Cust Item ID:

Required Date: 8/14/09 Req'd Qty: 1.00



Customer:

Reference:

Approvals:

Process Plan: *W*

Date:

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	----------------	--------------	--------------	---------------	---------------	------------------	----------------

Draw Nbr

Revision Nbr

D350-748-141

Rev D

100

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA648□2-Turn first side as per Folio FA648□3- File transition lines smooth.

am 09-09-100

110

0.00



QC1- Inspect dimensions to dimension sheet

QC

Memo

0.00

Quality Control

am 09-09-100

120

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA648□2- File transition lines smooth.□3- Scribe Part & Batch as per Dwg D350-748-141

am 09-09-100

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 50625

July 17, 2009 11:40:07 AM



Page 2

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: D

Stop



Item Name: Crosstube Turning Detail

Start Date: 7/24/09 Start Qty: 1.00



Cust Item ID:

Required Date: 8/14/09 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	----------------	--------------	--------------	---------------	---------------	------------------	----------------

130	QC1- Inspect dimensions to dimension sheet	0.00							
-----	--	------	--	--	--	--	--	--	--



QC	Memo	0.00							
----	------	------	--	--	--	--	--	--	--

Quality Control

Q.M. 09 - 09 - 1011

140	QC8- Inspect parts - second check	0.00							
-----	-----------------------------------	------	--	--	--	--	--	--	--



QC	Memo	0.00							
----	------	------	--	--	--	--	--	--	--

Quality Control

1 P - AWM9-10-07

150	Large Fab	0.00							
-----	-----------	------	--	--	--	--	--	--	--



Large Fab	Memo	0.00							
-----------	------	------	--	--	--	--	--	--	--

Large Fab

Grind machining marks

1 0 - AWM9-10-07

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 50625

July 17, 2009 11:40:07 AM



Page 3

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: D

Stop



Item Name: Crosstube Turning Detail

Start Date: 7/24/09 Start Qty: 1.00



Cust Item ID:

Required Date: 8/14/09 Req'd Qty: 1.00



Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
160 	Outsource process - Heat Treat	0.00							
Outsource1	Memo	0.00							
Outsource process - Heat Treat	Issue P/O: <u>10539</u> <input type="checkbox"/> Heat Treat to min 180 KSI As per Dwg D350-748-141 <input type="checkbox"/> (MIL-T-6736 OR AMS 2759-1C) <input type="checkbox"/> Sand Blast tube after Heat Treat <input type="checkbox"/> Possible Supplier: Vac Aero <input type="checkbox"/> Ensure Certificate of Conformity is attached								
170 	Receive & Inspect for Damage & Mat'l Certs	0.00							
Packaging	Memo	0.00							
Packaging	Ensure certificate of conformaty is attached								
180 	QC6- Inspect dimensions to drawing	0.00							
QC	Memo	0.00							
Quality Control									

PL 09-10-7

P 9/11/06

⇒ 809/11/23

Ⓢ

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 50625

July 17, 2009 11:40:07 AM



Page 4

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: D

Stop



Item Name: Crosstube Turning Detail

Start Date: 7/24/09 Start Qty: 1.00



Cust Item ID:

Required Date: 8/14/09 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	----------------	--------------	--------------	---------------	---------------	------------------	----------------

190

0.00



Packaging

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack ☐ Location:

Back

Hall

MB 09-11-23

200

QC21- Final Inspection - Work Order Release

0.00



QC

Memo

0.00

Quality Control

09/11/24 MF 09-11-23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

July 17, 2009 11:40:07 AM

Page 1

Work Order ID: 50625



Parent Item: D350-748-141TRNRevD



Parent Item Name: Crosstube Turning Detail

Start Date: 7/24/09

Required Date: 8/14/09

Comments:

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
---------------------------------	------------------------	---------------	-------------	---------------------	------------------	-----------------	--------------------	----------------	--------------------------	---------------	----------------	--------

D6017-115RevA		Manufactured	No			110	Each	42.0000	1.0000			
---------------	--	--------------	----	--	--	-----	------	---------	--------	--	--	--



Crosstube Material



G.M. 09-09-10 (1)

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

LG

42

32912

42

1

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order: 50625
Description: Crosstube Assembly (AS350/355 High Fwd)		Part Number: D350-748-141
Inspection Dwg: D350-748-141 Rev: D		Page 1 of 1

FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.240	/		
	2.180	+0.005/-0.000	2.184	/		
	2.180	+0.005/-0.000	2.182	/		
	2.237	+0.005/-0.000	2.238	/		
	2.272	+0.005/-0.000	2.273	/		
	2.306	+0.005/-0.000	2.307	/		
	2.339	+0.005/-0.000	2.339	/		
	2.339	+0.005/-0.000	2.339	/		
	0.062	+/-0.010	0.062	/		
	4.26	+/-0.030	4.273	/		
	R0.063	+/-0.010	R0.063	/		
	R0.50	+/-0.030	R0.500	/		
SIDE B	2.240	+0.005/-0.000	2.242	/		
	2.180	+0.005/-0.000	2.184	/		
	2.180	+0.005/-0.000	2.185	/		
	2.237	+0.005/-0.000	2.242	/		
	2.272	+0.005/-0.000	2.275	/		
	2.306	+0.005/-0.000	2.310	/		
	2.339	+0.005/-0.000	2.339	/		
	2.339	+0.005/-0.000	2.339	/		
	0.062	+/-0.010	0.062	/		
	4.26	+/-0.030	4.272	/		
	R0.063	+/-0.010	R0.063	/		
	R0.50	+/-0.030	R0.500	/		
	110.27	+/-0.060	110.290	/		

Measured by: R.M.	Audited by: ALM	Prototype Approval:	N/A
Date: 09.09.10	Date: 9-10-07	Date:	N/A

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	

DART

RELEASED

06.10.31

DESIGN QP	DRAWN BY QP	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
CHECKED H	APPROVED H	DRAWING NO. D350-748-141	REV. D SHEET 1 OF 3
DATE 06.10.31		TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE NTS
A	06.03.31	NEW ISSUE	
B	06.06.30	ADD D6017-115 & PRIME AND PAINT	
C	06.08.14	ADD CAD PLATING	
D	06.10.31	MAG. PARTICLE AND CAD PLATE AS MFD.	

QTY	P/N	DESCRIPTION
X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
1	D6017-115	CROSSTUBE (OR D6015-125)
2	D3502-1	SUPPORT
2	D2856-400-710	ABRASION STRIP
1	AELS-1032-225	INSERT
1	AN960JD10	WASHER
2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
1	MS27039-1-10	SCREW

D350-748-141 CROSSTUBE:

- 1) MATERIAL: MANUFACTURED FROM D6017-115 OR D6015-125
FINISHED LENGTH = 110.27±0.06
- 2) MACHINE PER MACHINING DETAIL ON PAGE 3. BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITIONS SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 3) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 4) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 5) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING.
- 6) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 7) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 8) INSTALL D2856-400-710 ABRASION STRIP WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 9) TORQUE MS21920-20 CLAMPS 60 TO 80 IN-LB
- 10) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 11) ALL DIMENSIONS ARE IN INCHES
- 12) PART IS SYMMETRIC ABOUT CENTERLINE EXCEPT FOR Ø0.297 HOLE.

UNDER REVIEW

09.02.05
Per per #09.001

SHOP COPY

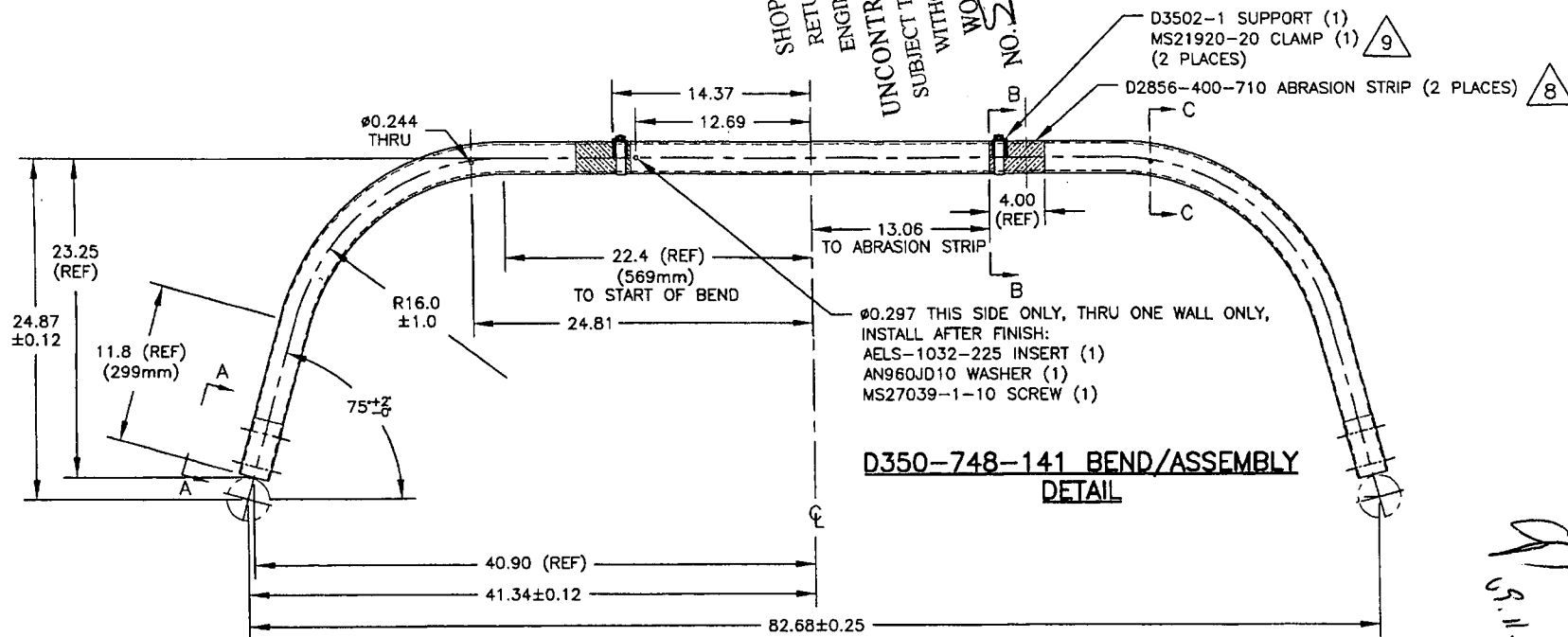
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 50625

OK 06.10.31

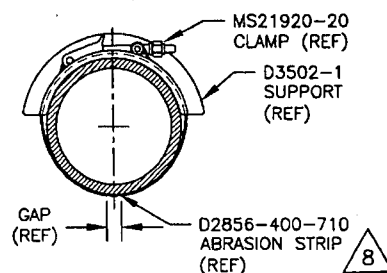
Copyright © 2006 by DART AEROSPACE LTD

THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED, OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.

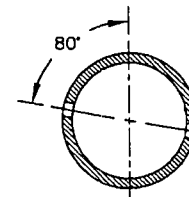
SHOP COPY
RETURN TO
ENGINEERING COPY
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER NO. 50625



SECTION B-B
SCALE 1:2



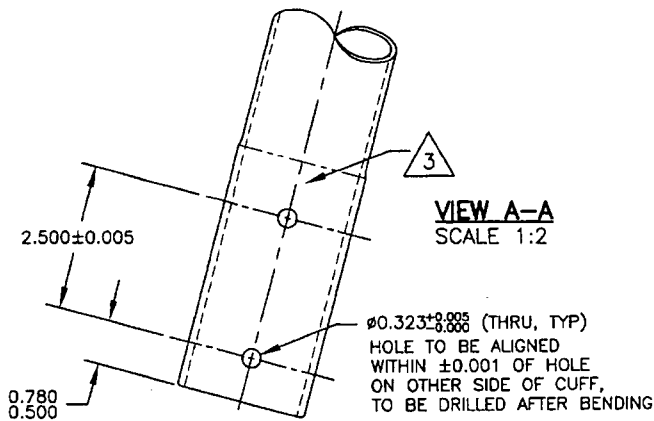
SECTION C-C
SCALE 1:2



UNDER REVIEW
09.02.05

UNDER REVIEW
02.16
OK 07.10.22

RELEASED
06.10.31



COPYRIGHT © 2006 BY DART AEROSPACE LTD.

THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.

DESIGN	97	DRAWN BY	97	DART	DART AEROSPACE LTD. WARRICK, ONTARIO, CANADA
CHECKED	#	APPROVED	#	DRAWING NO.	REV. D
DATE	06.10.31	TITLE	CROSSTUBE (AS 350/355 HI FWD)	SHEET 2 OF 3	SCALE

WITHOUT
WORK ORDER
50625



04.02.05



RELEASED

9/10-31

0.062 MIN

RED WING
EDGE
URE
ATH
I.D.

RO.063

4.26±0.03 FROM END OF
TUBE TO START OF RAD

SEE DETAIL E

DETAIL D: COFF
SCALE 1:1

THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL
AND IS SUPPLIED ON THE EXPRESS CONDITION
THAT IT IS NOT TO BE USED FOR ANY PURPOSE
OR COPIED OR COMMUNICATED TO ANY OTHER
PERSON WITHOUT WRITTEN PERMISSION FROM
DART AEROSPACE LTD.

DESIGN 42	DRAWN BY 42	DART	DART AEROSPACE LTD. HAMMERSLEY, GORDON, CANADA	
CHECKED #	APPROVED #	DRAWING NO. D350-748-141	REV. D SHEET 3 OF 3	
DATE 06.10.31		TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE 1:3	



VAC AERO
INTERNATIONAL INC.

RELEASE NC

GST No. : R105468102

OAK 113616



HEAD OFFICE
1371 SPEERS ROAD, OAKVILLE, ONTARIO
CANADA L6L 2X5
TEL: (905) 827-4171 FAX: (905) 827-7489



2009 WYECROFT ROAD, UNIT B
OAKVILLE, ONTARIO
CANADA L6L 6J4
TEL: (905) 827-7377 FAX: (905) 827-1380



QUEBEC DIVISION
7450 RUE VÉRITÉ STREET, ST. LAURENT, QUÉBEC
CANADA H4S 1C5
TEL: (514) 334-4240 FAX: (514) 334-6269

11/03/20

MM/DD/YY

PAGE: 1

BILL TO: 1DAR01
DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY, ON

K6A 1K7

K6A 1K7

DATE SHIPPED	SHIP VIA	F.O.B.
11/03/2009		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
10539		NET 30 DAYS

PART No.	DESCRIPTION	UOM	QTY ORD	QTY SHPD	TEST RESULTS
D350-748	-141/241	EA	12	12	
<p>Process Specifications: Procedure: 4353 HEAT TREATED TO 180 KSI MIN. PER DRAWING 100% HARDNESS CHECKED AS PER ASTM E-18 40/45 HRC MATERIAL: 4130</p> <p>4 PIECES B48603, B48604, B48605, B48606, P/N D350-748-241 8 PIECES B50622, B50627, B50628, B50629, P/N D350-748-141 B50621, B50623, B50623, B50625</p>					
<p>100% HARDNESS TEST 1.2 pas. 42/43 HRC</p> <p>VA.I.O. TH. 25 Q.C.</p> <p>GP 08.11.23</p>					

I hereby certify that the material covered by this release note has been inspected and tested and conforms to all specifications relevant thereto in accordance with the conditions of the contract / or purchase order.

ON BEHALF OF VAC AERO INTERNATIONAL INC.



METAL TREATING INSTITUTE

Shirley Robinson
Authorized Q.C. Inspector



VACUUM BRAZING · HEAT TREATING · SPECIAL PROCESSING · FURNACE EQUIPMENT
TURBINE COMPONENT OVERHAUL · PLASMA AND OTHER COATINGS